AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
J	1 of 4

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
0004	10-Jan-2005	W16ROE-4308-5191	

6. ISSUED BY CODE W912DS

USA ENGINEER DISTRICT, NEW YORK
ATTN:CENAN-CT ROOM 1843
26 FEDERAL PLAZA
NEW YORK NY 10278

7. ADMINISTERED BY (If other than item 6) CODE

See Item 6

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)

CODE FACILITY CODE

X	9A. AMENDMENT OF SOLICITATION NO. W912DS-05-B-0004
X	9B. DATED (SEE ITEM 11) 30-Nov-2004
	10A. MOD. OF CONTRACT/ORDER NO.
	10B. DATED (SEE ITEM 13)

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer [ ] is extended, [X] is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

[ ] A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

[ ] B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

[ ] C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

[ ] D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

The purpose of this amendment is :

1) To incorporate questions and Government responses. Answers are for informational purposes only.

2) To incorporate revised specifications. Section 15995A COMMISSIONING OF HVAC SYSTEMS has been reissued in it's entirety.

3) To incorporate a revised drawing, file number 8008-11093, Drawing M-501, sheet 94 of 131.

The bid opening date remains unchanged, 19 January 2005 at 10:00 AM Eastern Standard Time.

All other terms and conditions remain the same.

Note: Bidders must acknowledge receipt of this amendment by the date specified in the solicitation (or as amended) by one of the following methods: In the space provided on the SF1442, by separate letter, or by telegram, or by signing the block 15 below. FAILURE TO ACKNOWLEDGE AMENDMENTS BY THE DATE AND TIME SPECIFIED MAY RESULT IN REJECTION OF YOUR BID IN ACCORDANCE WITH THE LATE BID, LATE MODIFICATIONS OF BIDS OR LATE WITHDRAWAL OF BIDS (FAR 14.304)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
	TEL: EMAIL:

15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)		BY (Signature of Contracting Officer)	10-Jan-2005

SUMMARY OF CHANGES

SECTION SF 30 - BLOCK 14 CONTINUATION PAGE

The following have been added by full text:
AMENDMENT #4

AMENDMENT 0004 TO DRAWINGS AND SPECIFICATIONS FOR FY05 DORMITORY REPLACEMENT, THULE AIR BASE, GREENLAND – W912DS-05-B-0004

TO OFFERORS
The following changes shall be made to the drawings and specifications.

DRAWINGS

The following DRAWINGS have been **REVISED but not REISSUED**.

1) **CHANGE**, Drawing file number 8008-11093, Drawing **M-501,** sheet 94 of 131.
   a) Detail 4, STEAM-TO-WATER HEAT EXCHANGER DETAIL; **ADD** the following note: "Provide & install circuit setter (Flow meter) on water side of heat exchanger."

SPECIFICATIONS

The following SPECIFICATION has been **REVISED AND not REISSUED as indicated below:**

1) Paragraph 43.c – Messing Facilities and Food: delete the wording in the first sentence; "Meals, at no cost to the Contractor…." And replace with " Meals, will be charged at the prevailing Dining Hall rates and are scheduled ….."

The following SPECIFICATION has been **REVISED AND REISSUED.**

Section **15995A COMMISIONING OF HVAC SYSTEMS** has been reissued in it's entirety.

1) More information on the pre-commissioning checklist and on the functional performance checklist for the heat recovery components in the heat recovery ventilation units has been provided in addition to information for the steam-to-water heat exchangers and the liquid-to-liquid heat exchangers.

BIDDER'S QUESTIONS AND GOVERNMENT REPLY

(Questions that may be of general interest of all bidders/Government and that are not readily answered by the proceeding changes will appear below. These questions may have been paraphrased or altered to represent several questions regarding the same subject and/or clarify and simplify the question(s).

Questions and answers are issued to the Offerors/Bidders for information only.) Questions appear in NORMAL type-face and the response follows in **BOLD** type-face.

Responses to questions that require further clarification will be found in the main body of the addendum above.

Questions Set A

1) We are having difficulties finding out what is supposed to be demolished and what will be standing. Is it correct that outer-walls and existing concrete floors, including the steel construction underneath is starting - point? - but that everything else will be demolished. **R: The demolition starting point involves the asbestos and lead based paint abatement depicted on sheet H-101 and addressed in specification sections 13280A and 13282A. Relative to the remaining portion of the require d demolition, the entire building 103 is to be removed. See general note 1 of sheet AD101**

2) Are the floors in the staircase towers executed as the existing concrete floors in the building? **R: The interior stair treads and landings are of poured-in place concrete construction. The applicable details are referenced from Sheet A-404**

3) We would like to know if there is any specific type / products for doors and windows (inner and outer) **R: Door manufacturers are clearly referenced in the specifications.**

4) Are the outer walls supposed to be re-insulated by a prefabricated insulated steel / aluminum coffer directly on the concrete walls? **R: The building is not comprised of concrete walls. The only poured in place concrete occurs at the interior stair treads and landings, which do not directly interface with the insulated panels. The only panel/concrete interface occurs at the column foundation typically depicted on detail 5/A-518. This detail maintains an industry standard interface.**

5) Could you please direct us to drawings / specifications in the material that says something about various / wanted floor – coverings? **R: This information is included in the plans and specifications.**

6) Who is paying transportation from Denmark to Thule Airbase - Blue Water can't answer this for us. **R: This information is included in the plans and specifications and is also qualified in Amendment 001. There is a CLIN (Contract Line Item Number) space for the bidders to insert an anticipated cost in the Bid Schedule. Information has been provided in the specifications, Bid Schedule and amendments. The contract award will include awarding this CLIN (transportation from Denmark to Thule Air Base).**

7) The description says 72 rooms - ?? - is that including apartment rooms, communal areas and areas / rooms in general? - as a total!!
R: The total number of rooms required for this project is clearly addressed in the construction documents. A total of 48 bedrooms are called-out as addressed on the enlarged plans – Sheet A-401. The additional 24 rooms correspond to the kitchen/communal space included for each of the 24 modular units. 48+ 24 = 72 units.

8) Section 00800, paragraph 43.c – This amendment officially changes this paragraph alerting the Bidders that the meals cards are not free and each person will be charged the prevailing Dining Hall rates stated in the original paragraph.

(End of Summary of Changes)

SECTION 15995A

COMMISSIONING OF HVAC SYSTEMS
07/03

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Commissioning Team; G

List of team members who will represent the Contractor in the pre-commissioning checks and functional performance testing, at least 2 weeks prior to the start of pre-commissioning checks. Proposed revision to the list, prior to the start of the impacted work.

Tests; G

Detailed procedures for pre-commissioning checks and functional performance tests, at least 4 weeks prior to the start of pre-commissioning checks.

Pre-Commissioning Checks; G

Schedule for pre-commissioning checks and functional performance tests, at least 2 weeks prior to the start of pre-commissioning checks.

SD-06 Test Reports

Test Reports; G

Completed pre-commissioning checklists and functional performance test checklists organized by system and by subsystem and submitted as one package. The results of failed tests shall be included along with a description of the corrective action taken.

1.2 SEQUENCING AND SCHEDULING

The work described in this Section shall begin only after all work required in related Sections, including Section 15951A DIRECT DIGITAL CONTROL FOR HVAC and Section 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS, has been successfully completed, and all test and inspection reports and operation and maintenance manuals required in these Sections have been submitted and approved.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 COMMISSIONING TEAM AND CHECKLISTS

The Contractor shall designate team members to participate in the pre-commissioning checks and the functional performance testing specified herein. In addition, the Government will be represented by a representative of the Contracting Officer, the Design Agent's Representative, and the Using Agency. The team members shall be as follows:

Designation	Function
Q	Contractor's Chief Quality Control Representative
M	Contractor's Mechanical Representative
E	Contractor's Electrical Representative
T Representative	Contractor's Testing, Adjusting, and Balancing
C	Contractor's Controls Representative
D	Design Agent's Representative
O	Contracting Officer's Representative
U	Using Agency's Representative

Appendices A and B are provided as a general checklist and have been prepared to best match the various equipment selected during the design of this project. Each checklist shown in Appendices A and B shall be reviewed and modified as necessary to reflect equipment actually installed during construction of the project. The commissioning team shall review the accuracy and applicability of each item in the checklist and revise as needed. Equipment shown in the checklist but not installed for the project shall be annotated as "NA". Likewise, equipment installed but not listed in the checklist shall be added or revised accordingly. A note as to why it was added or revised shall be inserted with the reviewer's initial. The commissioning team shall also add or modify to any of the equipment checklist items as required and/or specified by the equipment manufacturer. Acceptance by each commissioning team member of each pre-commissioning checklist item shall be indicated by initials and date, unless an "X" is shown indicating that participation by that individual is not required. Acceptance by each commissioning team member of each functional performance test checklist shall be indicated by signature and date.

3.2 TESTS

The pre-commissioning checks and functional performance tests shall be performed in a manner which essentially duplicates the checking, testing, and inspection methods established in the related Sections. Where checking, testing, and inspection methods are not specified in other Sections, methods shall be established which will provide the information required. Testing and verification required by this section shall be performed during the Commissioning phase. Requirements in related Sections are independent from the requirements of this Section and shall not be used to satisfy any of the requirements specified in this Section. The Contractor shall provide all materials, services, and labor required to perform the pre-commissioning checks and functional performance tests. A pre-commissioning check or functional performance test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating non-Government commissioning team member of which participation is specified is not present for the test. The Contractor

shall reimburse the Government for all costs associated with effort lost due to tests that are aborted. These costs shall include salary, travel costs and per diem (where applicable) for Government commissioning team members. The Contractor shall submit Test Reports as specified in the Submittals paragraph.

3.2.1 Pre-Commissioning Checks

Pre-commissioning checks shall be performed for the items indicated on the checklists in Appendix A. Deficiencies discovered during these checks shall be corrected and retested in accordance with the applicable contract requirements.

3.2.2 Functional Performance Tests

Functional performance tests shall be performed for the items indicated on the checklists in Appendix B. Functional performance tests shall begin only after all pre-commissioning checks have been successfully completed. Tests shall prove all modes of the sequences of operation, and shall verify all other relevant contract requirements. Tests shall begin with equipment or components and shall progress through subsystems to complete systems. Upon failure of any functional performance test checklist item, the Contractor shall correct all deficiencies in accordance with the applicable contract requirements. The checklist shall then be repeated until it has been completed with no errors.

APPENDIX A

PRE-COMMISSIONING CHECKLISTS

Pre-commissioning checklist - Piping

For All Piping System

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Piping complete.	___	___	X	___	X	___	___	___
b. As-built shop drawings submitted.	___	___	X	___	X	___	___	___
c. Piping flushed and cleaned.	___	___	X	___	X	___	___	___
d. Strainers cleaned.	___	___	X	___	X	___	___	___
e. Valves installed as required.	___	___	X	___	X	___	___	___
f. Piping insulated as required.	___	___	X	___	X	___	___	___
g. Thermometers and gauges installed as required.	___	___	X	___	X	___	___	___
h. Verify operation of valves.	___	___	X	___	___	___	___	___
i. Air vents installed as specified.	___	___	X	X	X	___	___	___
j. Flexible connectors installed as specified	__	___	X	X	X	___	___	___
k. Verify that piping has been labeled and valves identified as specified.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Hydrostatic test complete.	___	___	X	___	X	___	___	___
b. TAB operation complete.	___	___	X	___	___	___	___	___

Pre-commissioning Checklist - Ductwork

For Air Handler: All

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Ductwork complete.	___	___	X	___	X	___	___	___
b. As-built shop drawings submitted.	___	___	X	___	X	___	___	___
c. Ductwork leak test complete.	___	___	X	___	X	___	___	___
NOTE: The first bracketed item d will be used for Army projects, the second for Air Force projects.								
d. Fire dampers, smoke dampers, and access doors installed as required.	___	___	X	___	X	___	___	___
e. Ductwork insulated as required.	___	___	X	___	X	___	___	___
f. Thermometers and gauges installed as required.	___	___	___	___	___	___	___	___
g. Verify open/closed status of dampers.	___	___	X	___	X	___	___	___
h. Verify smoke and fire damper operation.	___	___	X	___	___	___	___	___
i. Flexible connectors installed as specified	__	___	X	___	X	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. TAB operation complete.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Heat Recovery/Ventilation Unit

For Ventilation Unit: All

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Vibration isolation devices installed.	___	___	X	X	X	___	___	___
b. Inspection and access doors are operable and sealed.	___	___	X	___	X	___	___	___
c. Casing undamaged.	___	___	X	X	X	___	___	___
d. Insulation undamaged.	___	___	X	X	X	___	___	___
e. Condensate drainage is unobstructed. (Visually verify drainage by pouring a cup of water into drain pan.)	___	___	X	X	X	___	___	___
f. Fan belts adjusted.	___	___	X	___	X	___	___	___
g. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
h. Filters in place and clean	___	___	X	___	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	X	___	___	___
b. Power available to unit control panel.	___	___	___	X	___	___	___	___
c. Proper motor rotation verified.	___	___	___	___	X	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Coils								
a. Hot water piping properly connected.	___	___	X	X	X	___	___	___
b. Hot water piping pressure tested.	___	___	X	X	X	___	___	___
c. Air vents installed on water coils as specified.	___	___	X	X	X	___	___	___
d. Any damage to coil fins has been repaired.	__	___	X	___	X	___	___	___
Heat Exchanger								
a. Heat exchanger undamaged and sealed.	___	___	___	X	___	___	___	___
___								
b. Bypass actuator properly installed.	___	___	X	X	X	___	___	___

Pre-commissioning Checklist - Heat Recovery/Ventilation Unit

For Ventilation Unit: All

Checklist Item	Q	M	E	T	C	D	O	U
c. Bypass actuator operable.	___	___	X	X	X	___	___	___
Controls								
a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	___	___	___	___	___
c. Dampers/actuators properly installed.	___	___	X	___	___	___	___	___
d. Dampers/actuators operable.	___	___	X	___	___	___	___	___
e. Verify proper location, installation and calibration of duct static pressure sensor.	___	___	X	___	___	___	___	___
f. Exhaust fan VFD operable.	___	___	X	___	___	___	___	___
g. Air handler controls system operational.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Construction filters removed and replaced.	__	___	X	___	___	___	___	___
b. TAB report submitted.	___	___	X	___	X	___	___	___
c. TAB results within limits specified in Section 15990A								
d. TAB results for outside air intake within limits specified in Section 15990A	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Pumps

For Pump: All

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Pumps grouted in place.	___	___	X	X	X	___	___	___
b. Pump vibration isolation devices functional.	___	___	X	X	X	___	___	___
c. Pump/motor coupling alignment verified.	___	___	X	X	X	___	___	___
d. Piping system installed.	___	___	X	X	X	___	___	___
e. Piping system pressure tested.	___	___	X	X	X	___	___	___
f. Pump not leaking.	___	___	X	X	X	___	___	___
g. Field assembled couplings aligned to meet manufacturer's prescribed tolerances.	_____		X	X	X	___	___	___
Electrical								
a. Power available to pump disconnect.	___	___	___	X	X	___	___	___
b. Pump rotation verified.	___	___	___	X	X	___	___	___
c. Control system interlocks functional.	___	___	___	X	___	___	___	___
d. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. Pressure/temperature gauges installed.	___	___	X	___	X	___	___	___
b. Piping system cleaned.	___	___	X	X	X	___	___	___
c. Chemical water treatment complete.	___	___	X	X	X	___	___	___
d. Water balance complete.	___	___	X	___	X	___	___	___
e. Water balance with design maximum flow.	___	___	X	___	X	___	___	___
f. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Steam/Hot Water Converter

For Converter: All

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Converter steam piping installed.	___	___	X	___	X	___	___	___
b. Converter steam piping tested.	___	___	X	X	X	___	___	___
c. Hot water piping installed.	___	___	X	___	___	___	___	___
d. Hot water piping tested.	___	___	X	X	X	___	___	___
e. Makeup water piping installed.	___	___	X	X	X	___	___	___
f. Pre-piped specialties installed as specified.	___	___	X	X	X	___	___	___
g. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Startup								
a. Hot water system cleaned and filled.	___	___	X	X	X	___	___	___
b. All steam traps and non-return valves operational.	___	___	X	X	X	___	___	___
c. All sensors and gauges properly operational.	___	___	X	X	X	___	___	___
d. Converter safety/protection devices tested.	___	___	X	X	X	___	___	___
e. Converter startup and checkout complete.	___	___	X	X	X	___	___	___
Controls								
a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	___	___	___	___	___

Pre-commissioning Checklist - Liquid-to-Liquid Heat Exchanger

For Heat Exchanger: All

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Hot water piping installed.	___	___	X	___	___	___	___	___
b. Hot water piping tested.	___	___	X	X	X	___	___	___
c. Makeup water piping installed.	___	___	X	X	X	___	___	___
d. Air vents installed as specified.	___	___	X	X	X	___	___	___
e. Manufacturer's required maintenance clearance provided.	___	___	X	X	X	___	___	___
Startup								
a. Hot water system cleaned and filled.	___	___	X	X	X	___	___	___
b. Safety/protection devices tested.	___	___	X	X	X	___	___	___
c. Startup and checkout complete.	___	___	X	X	X	___	___	___
Controls								
a. Control valves/actuators properly installed.	___	___	X	___	___	___	___	___
b. Control valves/actuators operable.	___	___	X	___	___	___	___	___

Pre-commissioning Checklist - Unit Heater

For Unit Heater: All

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Hot water piping properly connected.	___	___	X	___	___	___	___	___
b. Hot water piping pressure tested.	___	___	X	___	___	___	___	___
c. Air vent installed on hot water coil with shutoff valve as specified.	___	___	X	X	X	___	___	___
d. Any damage to coil fins has been repaired.	___	___	X	___	X	___	___	___
e. Manufacturer's required maintenance/ operational clearance provided.	___	___	X	X	X	___	___	___
Electrical								
a. Power available to unit disconnect.	___	___	___	X	___	___	___	___
b. Proper motor rotation verified.	___	___	___	X	X	___	___	___
c. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Controls								
a. Control valves properly installed.	___	___	X	___	___	___	___	___
b. Control valves operable.	___	___	X	X	___	___	___	___
c. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - Fan

For Exhaust Fan: All

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. Fan belt adjusted.	___	___	X	___	X	___	___	___
Electrical								
a. Power available to fan disconnect.	___	___	___	X	___	___	___	___
b. Proper motor rotation verified.	___	___	___	___	X	___	___	___
c. Verify that power disconnect is located within sight of the unit it controls.	___	___	___	X	___	___	___	___
Controls								
a. Control interlocks properly installed.	___	___	___	X	___	___	___	___
b. Control interlocks operable.	___	___	___	X	___	___	___	___
c. Dampers/actuators properly installed.	___	___	X	___	___	___	___	___
d. Dampers/actuators operable.	___	___	X	___	___	___	___	___
e. Verify proper location and installation of thermostat.	___	___	X	___	___	___	___	___
Testing, Adjusting, and Balancing (TAB)								
a. TAB results within limits specified in Section 15990A	___	___	X	___	X	___	___	___
b. TAB Report submitted.	___	___	X	___	X	___	___	___

Pre-commissioning Checklist - HVAC System Controls

For HVAC System: All

Checklist Item	Q	M	E	T	C	D	O	U
Installation								
a. As-built shop drawings submitted.	___	___	X	X	___	___	___	___
b. Layout of control panel matches drawings.	___	___	X	X	___	___	___	___
c. Framed instructions mounted in or near control panel.	___	___	X	X	___	___	___	___
d. Components properly labeled (on inside and outside of panel).	___	___	X	X	___	___	___	___
e. Control components piped and/or wired to each labeled terminal strip.	___	___	X	X	___	___	___	___
f. EMCS connection made to each labeled terminal strip as shown.	___	___	X	X	___	___	___	___
g. Control wiring and tubing labeled at all terminations, splices, and junctions.	___	___	X	X	___	___	___	___
h. Shielded wiring used on electronic sensors.	__	__	X	X	___	___	___	___
Main Power and Control Air								
a. 110 volt AC power available to panel.	___	___	___	X	___	___	___	___
Testing, Commissioning, and Balancing								
a. Testing, Commissioning, and Balancing Report submitted.	___	___	X	___	___	___	___	___

APPENDIX B

FUNCTIONAL PERFORMANCE TESTS CHECKLISTS

Functional Performance Test Checklist - Pumps

For Pump: All

Prior to performing this checklist, ensure that for closed loop systems, system is pressurized and the make-up water system is operational or, for open loop systems, that the sumps are filled to the proper level.

1. Activate pump start using control system commands (all possible combination, on/auto, etc.). ON_____ AUTO_____ OFF_____

a. Verify pressure drop across strainer:

Strainer inlet pressure _____ kPa (_____ psig)
Strainer outlet pressure _____ kPa (_____ psig)

b. Verify pump inlet/outlet pressure reading, compare to Testing, Adjusting, and Balancing (TAB) Report, pump design conditions, and pump manufacturer's performance.

	DESIGN	SYSTEM TEST	ACTUAL
Pump inlet pressure (kPa gauge)	_____	_____	_____
Pump outlet pressure (kPa gauge)	_____	_____	_____

c. Operate pump at shutoff and at 100 percent of designed flow when all components are in full flow. Plot test readings on pump curve and compare results against readings taken from flow measuring devices.

	SHUTOFF	100 percent
Pump inlet pressure (kPa gauge)	_____	_____
Pump outlet pressure	_____	_____
Pump flow rate (L/s)	_____	_____

d. Operate pump at shutoff and at minimum flow or when all components are in full by-pass. Plot test readings on pump curve and compare results against readings taken from flow measuring devices.

	SHUTOFF	100 percent
Pump inlet pressure (kPa gauge)	_____	_____
Pump outlet pressure	_____	_____
Pump flow rate (L/s)	_____	_____

2. Verify motor amperage each phase and voltage phase to phase and phase to ground for both the full flow and the minimum flow conditions.

a. Full flow:

	PHASE 1	PHASE 2	PHASE 3
Amperage	_____	_____	_____
Voltage		_____	_____
Voltage		_____	
Voltage to ground	_____	_____	_____

b. Minimum flow:

Functional Performance Test Checklist - Pumps

For Pump: All

	PHASE 1	PHASE 2	PHASE 3
Amperage	_____	_____	_____
Voltage		_____	_____
Voltage		_____	
Voltage to ground	_____	_____	_____

3. Unusual vibration, noise, etc.

_____

_____

4. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - Heat Recovery/Ventilation Unit

For Ventilation Unit: All

Ensure that a slight negative pressure exists on inboard side of the outside air dampers throughout the operation of the dampers. Modulate OA, RA, and EA dampers from fully open to fully closed positions.

1. Functional Performance Test: Contractor shall verify operation of unit as per specification including the following:

a. The following shall be verified when the supply and exhaust fans operating mode is initiated:

(1) All dampers in normal position and exhaust fan VFD modulate to maintain the required static pressure. _____

(2) All valves in normal position. _____

(3) System safeties allow start if safety conditions are met. _____

(4) Exhaust fan VFD shall "soft-start" fan. _____

(5) Energize all laundry dryers one at a time and verify that the system airflows are maintained.
_____

b. Occupied mode of operation.

(1) Outside air damper open. _____

(2) Return air dampers at proper position.
_____

(3) Exhaust air damper open. _____

(4) Exhaust fan VFD receiving signal from DDC system and modulating fan to maintain exhaust duct airflow.
_____

(5) Hot water control valve modulating to maintain set points.
_____

(6) Bypass damper modulating properly in response to unit sensors and controls.
_____

(7) Heat exchanger providing specified recovery and efficiency.
_____

(8) Unit providing specified airflows.
_____

(9) Verify air pressure drops of all components within units.
_____

d. Unoccupied mode of operation

Functional Performance Test Checklist - Heat Recovery/Ventilation Unit

For Ventilation Unit: All

(1) All dampers in normal position. _____

(2) Fans off. _____

(3) Coil valves in proper position. _____

e. The following shall be verified when the supply and exhaust fans off mode is initiated:

(1) All dampers in normal position. _____

(2) All valves in normal position. _____

(3) Fans de-energize. _____

f. Verify safety shut down initiated by smoke detectors. _____

g. Verify safety shut down initiated by low temperature protection controls. _____

2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative

_____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Functional Performance Test Checklist - Steam/Hot Water Converter

For Converter: All

1. Functional Performance Test: Contractor shall demonstrate operation of heating system as per specifications including the following: Start building heating equipment to provide load for converter.

a. Verify control system energizes. _____

b. Verify converter senses hot water temperature below set point and control system modulates steam valve. _____

c. Shut off building heating equipment to remove load on heating system. Verify converter steam valve closes after load is removed. _____

2. Verify converter inlet/outlet pressure reading, compare to converter design conditions and manufacturer's performance data.

	DESIGN	ACTUAL
Converter inlet water temp (degrees C)	_____	_____
Converter outlet water temp (degrees C)	_____	_____
Converter inlet steam pressure (bar)	_____	_____
Determine water flow rate based on pressure drop through converter	_____	_____
Determine water flow rate with flow measuring device	_____	_____
Verify that temperature of water is in accordance with outdoor air reset schedule	_____	_____
Determine water flow rates	_____	_____
Determine water pressure drops	_____	_____

3. Verify proper operation of converter safeties. _____

4. Check and report unusual vibration, noise, etc.

_____

_____

5. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Functional Performance Test Checklist - Steam/Hot Water Converter

For Converter: All
Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - Liquid-to-Liquid Heat Exchanger

For Heat Exchanger: All

1. Functional Performance Test: Contractor shall demonstrate operation of heating system as per specifications including the following: Start building heating equipment to provide load for heat exchanger.

a. Verify control system energizes. _____

b. Verify control system senses hot water temperature below set point and control system modulates control valve.
_____

c. Shut off building heating equipment to remove load on heating system. Verify control valve fails correctly. _____

2. Verify heat exchanger inlet/outlet pressure reading, compare to heat exchanger design conditions and manufacturer's performance data.

	DESIGN	ACTUAL
Heat Exchanger inlet water temps (degrees C)	_____	_____
Heat Exchanger outlet water temps (degrees C)	_____	_____
Determine water flow rates based on pressure drop through heat exchanger	_____	_____
Determine water flow rate with flow measuring device	_____	_____
Verify that temperature of water is in accordance with outdoor air reset schedule	_____	_____
Determine water pressure drops	_____	_____

3. Check and report unusual vibration, noise, etc.
_____

_____

5. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative
_____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative
_____

Contractor's Controls Representative _____

Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - Liquid-to-Liquid Heat Exchanger

For Heat Exchanger: All

Contracting Officer's Representative _____

Using Agency's Representative _____

Functional Performance Test Checklist - HVAC Controls

For HVAC System: All

The Contracting Officer will select HVAC control systems to undergo functional performance testing. The number of systems shall not exceed 2
.

1. Functional Performance Test: Contractor shall verify operation of HVAC controls by performing the following tests:

a. Verify that controller is maintaining the set point by manually measuring the controlled variable with a thermometer, sling psychrometer, inclined manometer, etc.

b. Verify sensor/controller combination by manually measuring the controlled medium. Take readings from control panel display and compare readings taken manually. Record all readings.

Sensor _____
Manual measurement _____
Panel reading value _____

c. Verify system stability by changing the controller set point as follows:

(1) Air temperature - 10 degrees F

(2) Water temperature - 10 degrees F

(3) Static pressure - 10 percent of set point

(4) Relative humidity - percent (RH)

The control system shall be observed for 10 minutes after the change in set point. Instability or excessive hunting will be unacceptable.

d. Verify interlock with other HVAC controls.

e. Verify interlock with fire alarm control panel.

f. Verify interlock with EMCS.

g. Change controller set point 10 percent with EMCS and verify correct response.

2. Verify that operation of control system conforms to that specified in the sequence of operation.

3. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Chief Quality Control Representative _____

Contractor's Mechanical Representative _____

Functional Performance Test Checklist - HVAC Controls

For HVAC System: All

Contractor's Electrical Representative _____

Contractor's Testing, Adjusting and Balancing Representative _____

Contractor's Controls Representative _____

Contractor's Officer's Representative _____

Using Agency's Representative _____

-- End of Section --